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CLAIMS

What is claimed:

1. A method for replicating and amplifying a target nucleic acid sequence comprising:

a) reacting a primer that is complementary to a target sequence within a nucleic acid duplex with the nucleic acid duplex in the presence of a recombination factor to form a recombination intermediate, without previously denaturing said nucleic acid duplex;

b) admixing a polymerase with said recombination intermediate to form a polymerase complex, whereby the polymerase replicates the target sequence.

2. The method of claim 1 wherein said polymerase is a polymerase holoenzyme.

3. The method of claim 2 wherein said polymerase holoenzyme comprises a polymerase enzyme, a clamp protein, and a clamp loader protein.

4. The method of claim 3 wherein said polymerase enzyme, said clamp protein and said clamp loader are obtained from bacteriophage T4.

5. The method of claim 1 wherein said recombination factor is bacteriophage T4 UvsX protein.

6. The method of claim 4 wherein said polymerase is bacteriophage T4 gene product 43 polymerase, said clamp protein is bacteriophage T4 gene product 45 clamp protein and said clamp loader is bacteriophage T4 gene product 44/gene product 62 clamp loader complex.

7. The method of claim 1 wherein said recombination factor is *E. coli* Rec A protein.

8. The method of claim 1 wherein said recombination factor is Rad51

9. The method of claim 8 wherein said Rad51 is derived from yeast.

10. The method of claim 8 wherein said Rad51 is derived from a eukaryote.

11. The method of claim 1 wherein said primer is designed to anneal at complimentary sites flanking said target nucleic acid sequence.

12. The method of claim 2 wherein said polymerase holoenzyme complex comprises a viral, bacteriophage, eukaryote archaebacteria, or prokaryote polymerase holoenzyme complex.

13. The method of claim 12 wherein said bacteriophage is T4 bacteriophage T4, and said polymerase holoenzyme complex includes a bacteriophage T4 gene product 43 polymerase.

14. The method of claim 12 wherein said bacteriophage is bacteriophage is T4, and said polymerase holoenzyme complex includes a bacteriophage T4 gene product 45 clamp protein.

15. The method of claim 12 wherein said prokaryote is *E. coli* and said polymerase holoenzyme complex includes DNA polymerase III holoenzyme.

16. The method of claim 12 wherein said eukaryote is yeast and said polymerase holoenzyme complex includes DNA polymerase delta.

17. The method of claim 12 wherein said eukaryote is yeast and said polymerase holoenzyme complex includes DNA polymerase epsilon.

18. The method of claim 1 wherein a single stranded binding protein is used to facilitate downstream strand displacement synthesis by said polymerase.

19. The method of claim 18 wherein said single stranded binding protein is bacteriophage T4 gene product 32.

20. The method of claim 1 wherein a single stranded binding protein is used to destabilize the helix at or near the point of the primer template junction.

21. A method for reproducing and amplifying a target nucleic acid sequence within a nucleic acid duplex at a temperature below about 45°C comprising:

a) catalytically inserting a primer into said target nucleic acid sequence without previously denaturing said nucleic acid duplex in whole or in part to form a recombination intermediate;

b) admixing said recombination intermediate with a polymerase to form a polymerase complex, whereby said polymerase replicates the target nucleic acid sequence.

22. The method of claim 21 wherein said primer is pretreated with a single stranded nucleic acid binding protein.

23. The method of claim 21 wherein said primer be pretreated with a recombination factor.

24. The method of claim 23 wherein said recombination factor is bacteriophage T4 UvsX .

25. The method of claim 21 wherein said polymerase is bacteriophage T4 gene product 43 DNA polymerase.

26. The method of claims 1 or 21 wherein a helicase is used to facilitate replication by said polymerase.

27. The method of claim 26 where said helicase is bacteriophage T4 gene product 41 DNA helicase.

28. The method of claim 26 wherein said helicase is bacteriophage T4 replicative helicase complex, comprising bacteriophage T4 gp 41 and gp 59.

29. The method of claims 1 or 23 wherein an accessory factor is used to stabilize the recombination factor.

30. The method of claim 29 wherein said accessory factor is bacteriophage T4 UvsY.

31. The method of claim 1 or 21 wherein a combination of a helicase and an accessory factor is used.

32. The method of claim 21 wherein said helicase is bacteriophage T4 gene product 41 and said accessory factor is bacteriophage T4 UvsY.

33. A method of creating a library of nucleic acid sequences comprising:

a) incubating a first double-stranded nucleic acid with an enzyme with exonuclease activity to form a plurality of single stranded DNA regions having random sizes;

b) treating said plurality of single stranded DNA regions with a recombination factor to form a plurality of pretreated single stranded DNA regions;

c) adding a second double-stranded nucleic acid to the plurality of pretreated single stranded DNA regions to form a plurality of three stranded crossover junctions;

d) incubating said plurality of three stranded crossover junctions with a helicase to form a plurality of Holliday junctions; and

e) resolving said plurality of Holliday junctions by incubation with an endonuclease.

34. The method of claim 33 wherein said recombination factor is bacteriophage T4 UvsX.

35. The method of claim 33 wherein said helicase is bacteriophage T4 gene products 41 and 59.

36. The method of claim 33 wherein said helicase is bacteriophage T4 UvsW.

37. The method of claim 33 wherein said endonuclease is bacteriophage T4 gene product 49.